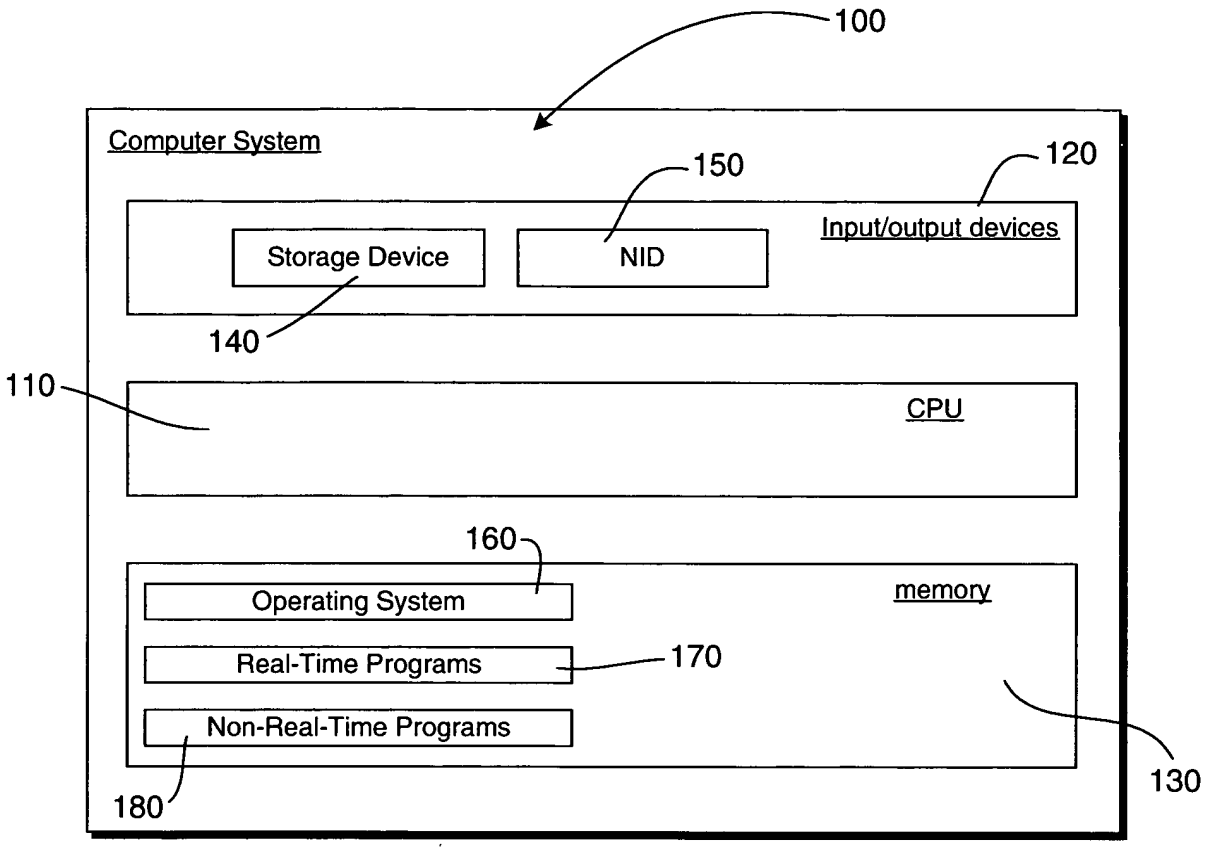

100
Computer System
150
120
Input/output devices
Storage Device
NID
140
110
CPU
160
Operating System
memory
Real-Time Programs
170
Non-Real-Time Programs
180
130

FIG. 1

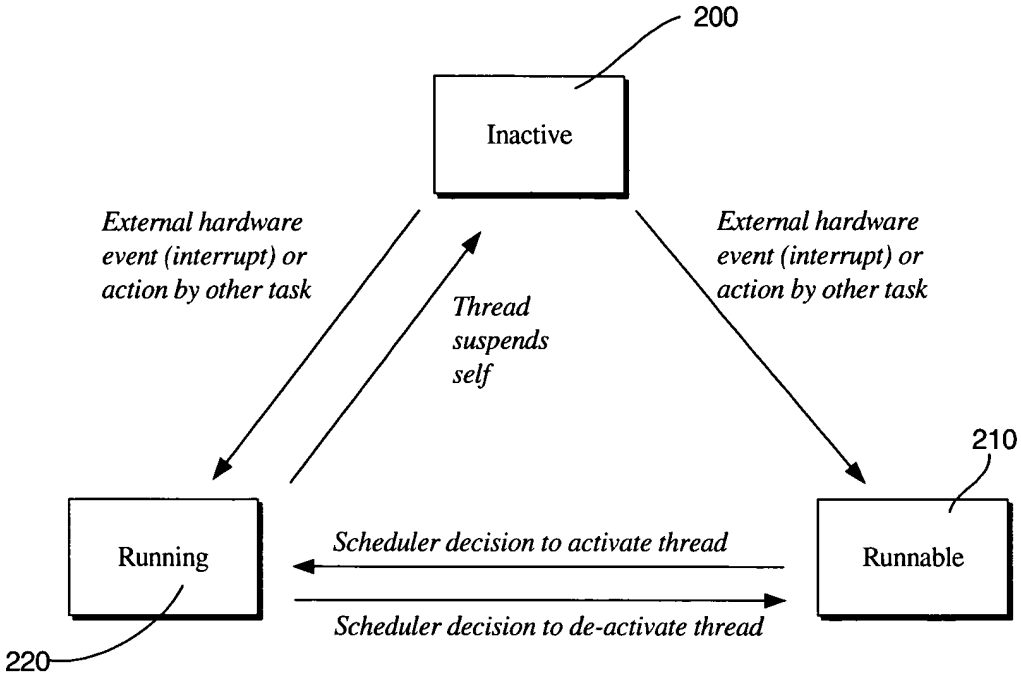

200
Inactive
External hardware event (interrupt) or action by other task
Thread suspends self
External hardware event (interrupt) or action by other task
210
Running
Scheduler decision to activate thread
Runnable
Scheduler decision to de-activate thread
220

FIG. 2

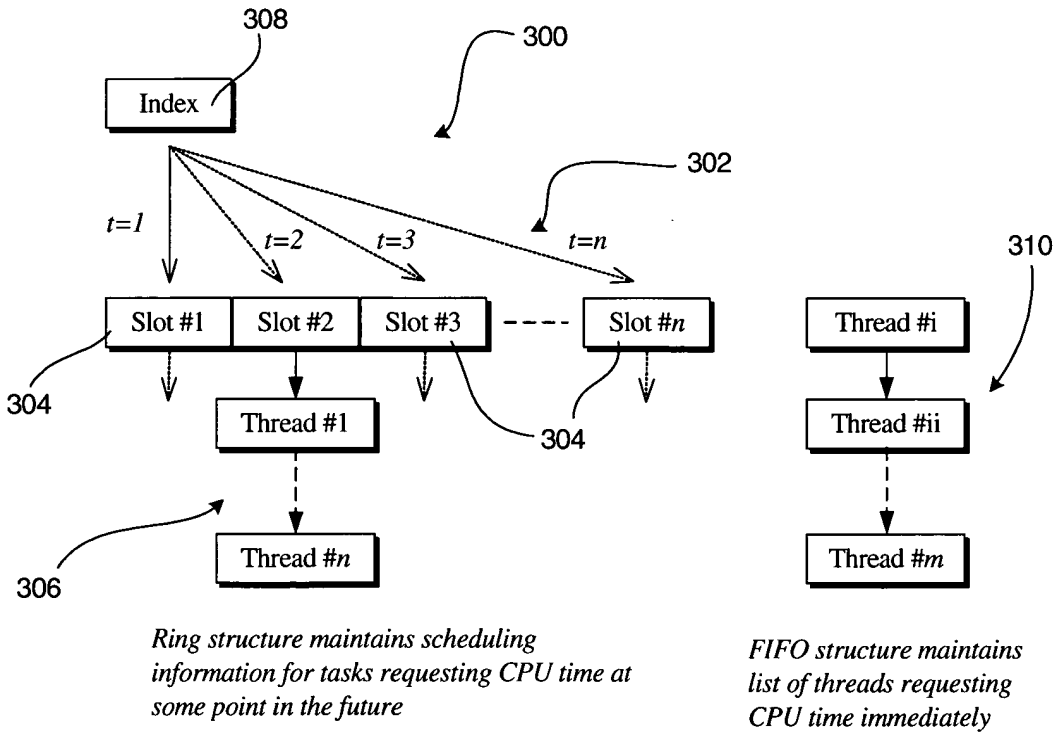

308
300
Index
302
t=1
t=2
t=3
t=n
Slot #1
Slot #2
Slot #3
Slot #n
304
Thread #1
304
Thread #n
306
Thread #i
310
Thread #ii
Thread #m
Ring structure maintains scheduling information for tasks requesting CPU time at some point in the future
FIFO structure maintains list of threads requesting CPU time immediately

FIG. 3

FIG. 4

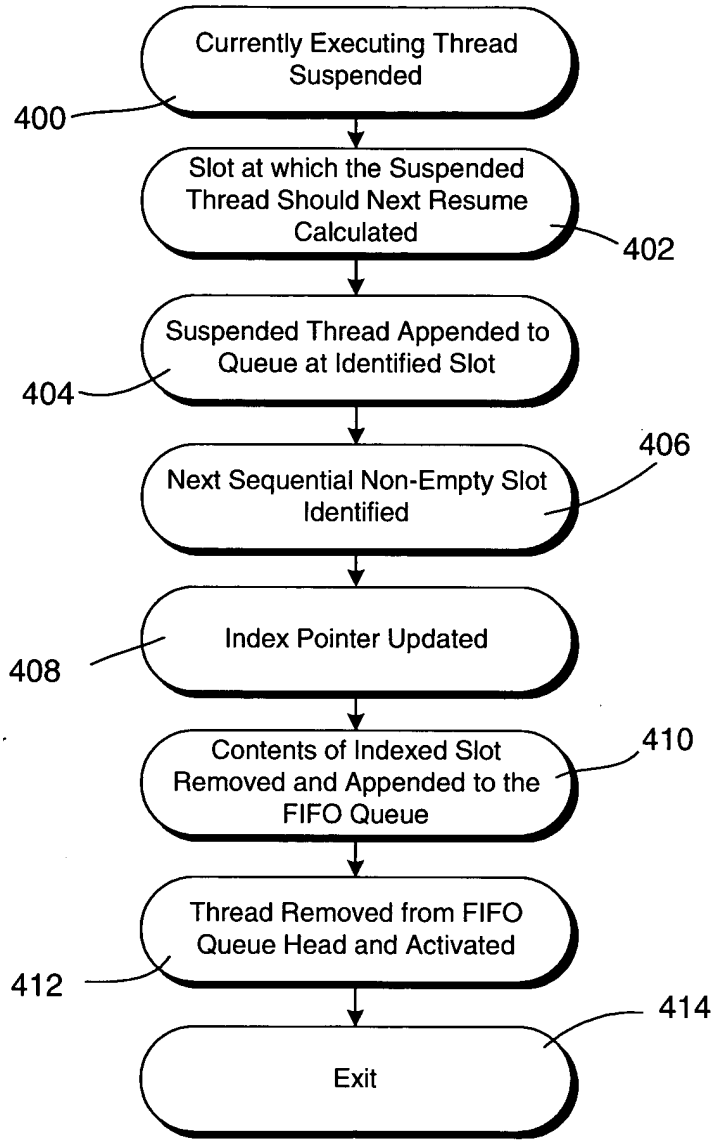
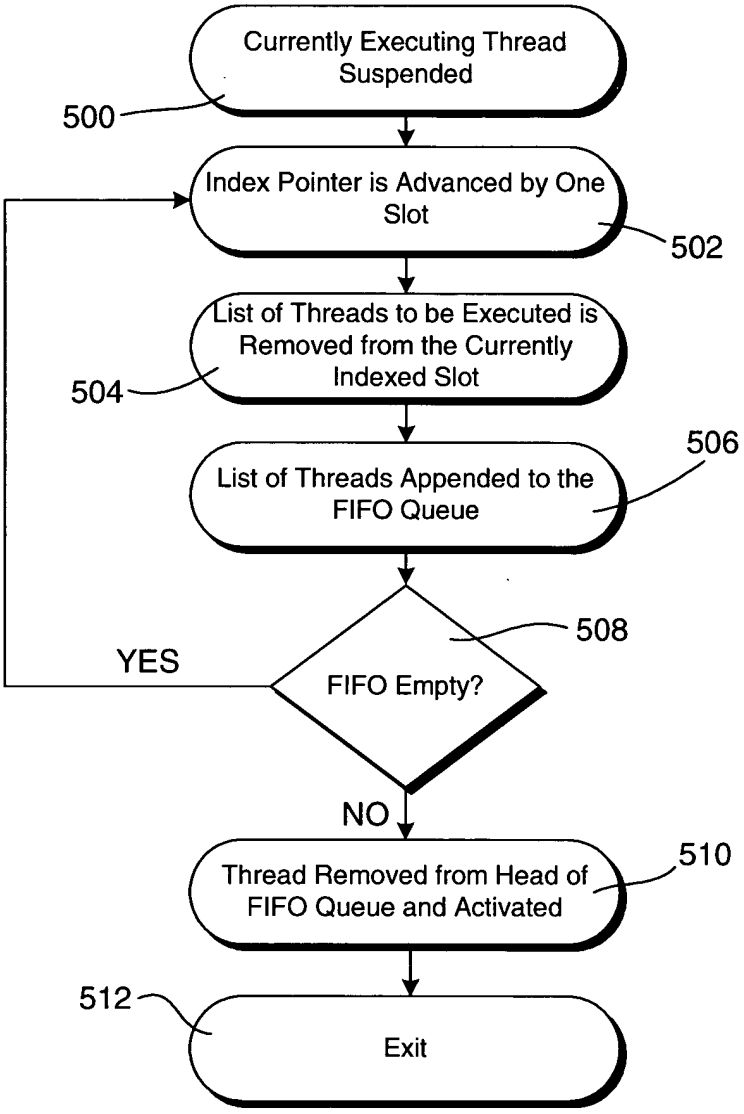

Currently Executing Thread Suspended
400
Slot at which the Suspended Thread Should Next Resume Calculated
402
Suspended Thread Appended to Queue at Identified Slot
404
Next Sequential Non-Empty Slot Identified
406
Index Pointer Updated
408
Contents of Indexed Slot Removed and Appended to the FIFO Queue
410
Thread Removed from FIFO Queue Head and Activated
412
Exit
414

FIG. 5


Currently Executing Thread Suspended
500
Index Pointer is Advanced by One Slot
502
List of Threads to be Executed is Removed from the Currently Indexed Slot
504
List of Threads Appended to the FIFO Queue
506
FIFO Empty?
508
YES
NO
Thread Removed from Head of FIFO Queue and Activated
510
512
Exit

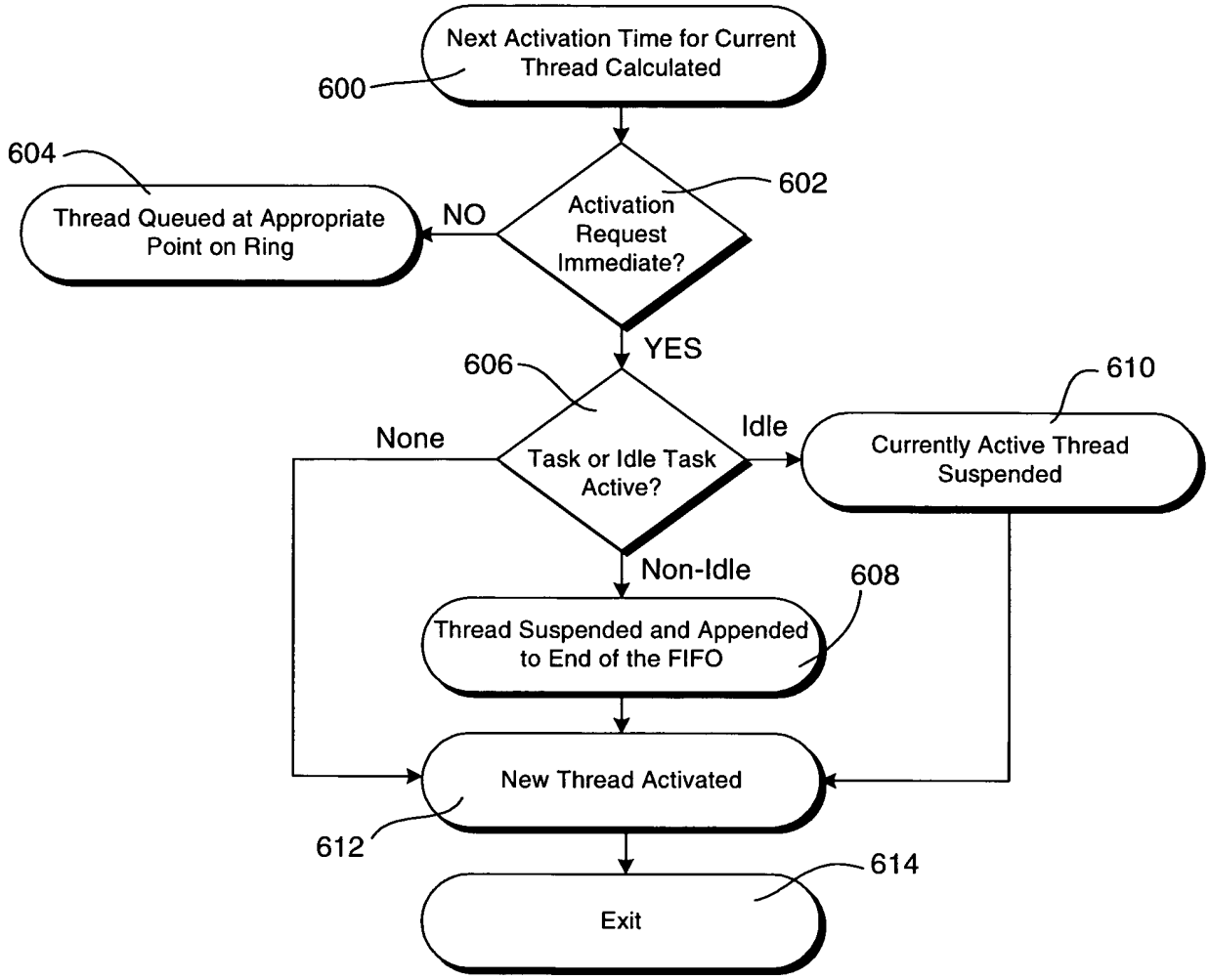
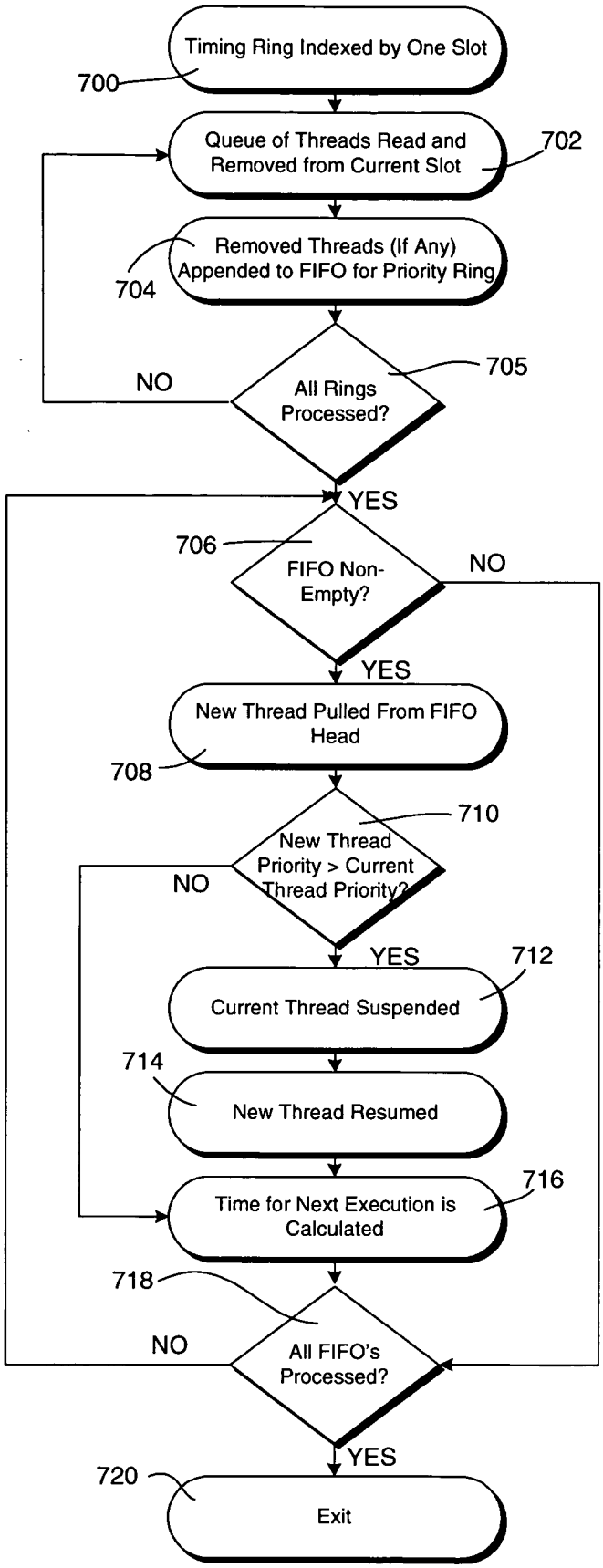

Next Activation Time for Current Thread Calculated
600
Activation Request Immediate?
602
NO
604
Thread Queued at Appropriate Point on Ring
YES
606
Task or Idle Task Active?
None
Idle
610
Currently Active Thread Suspended
Non-Idle
608
Thread Suspended and Appended to End of the FIFO
New Thread Activated
612
614
Exit

FIG. 6

FIG. 7


Timing Ring Indexed by One Slot
700
Queue of Threads Read and Removed from Current Slot
702
Removed Threads (If Any) Appended to FIFO for Priority Ring
704
All Rings Processed?
705
NO
YES
FIFO Non-Empty?
706
NO
YES
New Thread Pulled From FIFO Head
708
New Thread Priority > Current Thread Priority?
710
NO
YES
Current Thread Suspended
712
New Thread Resumed
714
Time for Next Execution is Calculated
716
All FIFO's Processed?
718
NO
YES
Exit
720

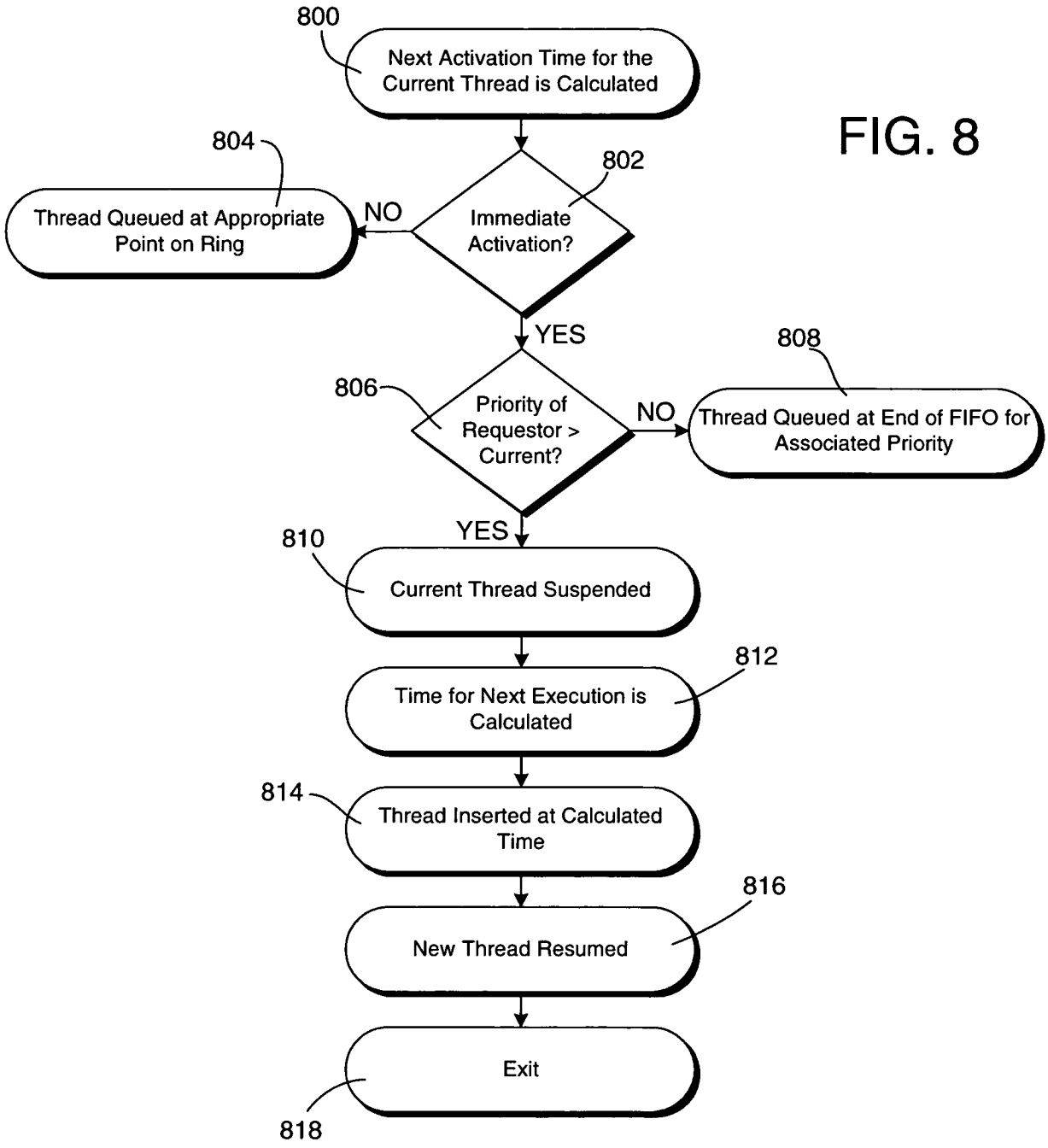

800
Next Activation Time for the Current Thread is Calculated
802
Immediate Activation?
804
NO
Thread Queued at Appropriate Point on Ring
YES
806
Priority of Requestor > Current?
NO
808
Thread Queued at End of FIFO for Associated Priority
YES
810
Current Thread Suspended
812
Time for Next Execution is Calculated
814
Thread Inserted at Calculated Time
816
New Thread Resumed
Exit
818

FIG. 8

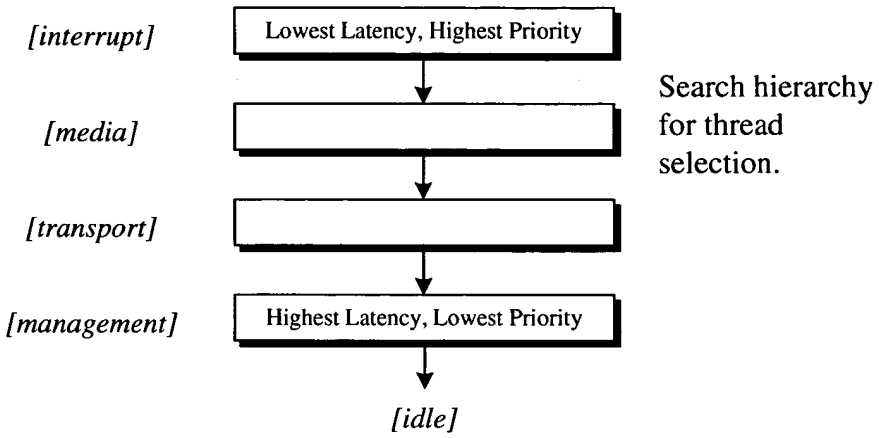

[interrupt]
Lowest Latency, Highest Priority
[media]
[transport]
[management]
Highest Latency, Lowest Priority
[idle]
Search hierarchy for thread selection.

FIG. 9